What is claimed is:

1) A composition of matter useful as a phosphor in light emitting diodes, which comprises a material described by the formula:

$$MA_2(S_xSe_y)_4:B$$

in which:

M comprises one or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn;

A comprises one or more elements selected from the group consisting of: Al, Ga, In, Y, La, and Gd;

B comprises one or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Cl, Br, F, I, Mg, Pr, K, Na, and Mn,

wherein B is present in any amount between 0.0001% and about 10 % in mole percent based on the total molar weight of said composition, and wherein x and y are each independently any value between 0 and 1, subject to the proviso that the sum of x and y is equal to any number in the range of between about 0.75 and about 1.25.

2) A composition according to claim 1 wherein $0 \leq x \leq 1$ and $0 \leq y \leq 1$.

3) A composition according to claim 1 wherein $0.5 \leq x \leq 1$ and $0 \leq y \leq 0.5$.

4) A composition according to claim 1 wherein $0 \leq x \leq 0.5$ and $0 \leq y \leq 0.5$.

5) A composition according to claim 1 wherein $0 \leq x \leq 0.5$ and $0.5 \leq y \leq 1.0$.

6) A composition according to claim 1 wherein x is about 0, and y is about 1.

7) A composition according to claim 1 wherein x is about 1, and y is about 0.

8) A composition according to claim 1 wherein M comprises zinc and strontium.

9) A composition according to claim 8 having the formula $Zn_uSr_vGa_2(S_xSe_y)_4$:Eu in which u is about 0.71; v is about 0.29; x is about 0.615; and y is about 0.385.

10) A composition comprising at least two different phosphors according to claim 1.

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11) A light emitting device comprising:

a) a light source selected from the group consisting of: light-emitting diodes and lasers, wherein said light source emits light having a wavelength of between about 360 and about 480 nanometers; and

b) a phosphor described by the formula:

$$MA_2(S_xSe_y)_4:B$$

in which:

M comprises one or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn;

A comprises one or more elements selected from the group consisting of: Al, Ga, In, Y, La, and Gd;

B comprises one or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Cl, Br, F, I, Mg, Pr, K, Na, and Mn,

wherein B is present in any amount between 0.0001% and about 10 % in mole percent based on the total molar weight of said composition, and wherein x and y are each independently any value between 0 and 1, subject to the proviso that the sum of x and y is equal to any number in the range of between about 0.75 and about 1.25.

12) A light emitting device according to claim 11, wherein said phosphor emits white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

13) A light emitting device according to claim 11 comprising a mixture of at least two different phosphors described by said formula.

14) A light emitting device according to claim 13, wherein said mixture of phosphors emit white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

15) A light emitting device according to claim 11 which comprises a phosphor having the formula $Zn_uSr_vGa_2(S_xSe_y)_4:Eu$ in which u is about 0.71; v is about 0.29; x is about 0.615; and y is about 0.385.

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16) A composition of matter useful as a phosphor in light emitting diodes, which comprises a material described by the formula:

$$MA_4(S_xSe_y)_7:B$$

in which:

M comprises one or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn;

A comprises one or more elements selected from the group consisting of: Al, Ga, In, Y, La, and Gd;

B comprises one or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Cl, Br, F, I, Mg, Pr, K, Na, and Mn,

wherein B is present in any amount between 0.0001% and about 10 % in mole percent based on the total molar weight of said composition, and wherein x and y are each independently any value between 0 and 1, subject to the proviso that the sum of x and y is equal to any number in the range of between about 0.75 and about 1.25.

17) A composition according to claim 16 wherein $0 \leq x \leq 1$ and $0 \leq y \leq 1$.

18) A composition according to claim 16 wherein $0.5 \leq x \leq 1$ and $0 \leq y \leq 0.5$.

19) A composition according to claim 16 wherein $0 \leq x \leq 0.5$ and $0 \leq y \leq 0.5$.

20) A composition according to claim 16 wherein $0 \leq x \leq 0.5$ and $0.5 \leq y \leq 1.0$.

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21) A composition according to claim 16 wherein x is about 0, and y is about 1.

22) A composition according to claim 16 wherein x is about 1, and y is about 0.

23) A composition according to claim 16 having the formula $Ba_uSr_vGa_4(S_xSe_y)_7$:Eu in which u is about 0.78, v is about 0.22, x is about 0.88; and y is about 0.12.

24) A composition comprising at least two different phosphors according to claim 16.

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25) A light emitting device comprising:

a) a light source selected from the group consisting of: light-emitting diodes and lasers, wherein said light source emits light having a wavelength of between about 360 and about 480 nanometers; and

b) a phosphor described by the formula:

$$MA_4(S_xSe_y)_7{:}B$$

in which:

M comprises one or more elements selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn;

A comprises one or more elements selected from the group consisting of: Al, Ga, In, Y, La, and Gd;

B comprises one or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Cl, Br, F, I, Mg, Pr, K, Na, and Mn,

wherein B is present in any amount between 0.0001% and about 10 % in mole percent based on the total molar weight of said composition, and wherein x and y are each independently any value between 0 and 1, subject to the proviso that the sum of x and y is equal to any number in the range of between about 0.75 and about 1.25.


26) A light emitting device according to claim 25, wherein said phosphor emits white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

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27) A light emitting device according to claim 25 comprising a mixture of at least two different phosphors described by said formula.

28) A light emitting device according to claim 27, wherein said mixture of phosphors emit white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

29) A light emitting device according to claim 25 which comprises a phosphor having the formula $Ba_uSr_vGa_4(S_xSe_y)_7$:Eu in which u is about 0.78, v is about 0.22, x is about 0.88; and y is about 0.12.

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30) A composition of matter useful as a phosphor in light emitting diodes, which comprises a material described by the formula:

$$(M1)_m(M2)_nA_p(S_xSe_y)_q{:}B$$
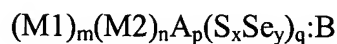
in which:

M1 comprises an element selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn;

M2 comprises an element selected from the group consisting of: Be, Mg, Ca, Sr, Ba, Zn which is different from M1;

A comprises one or more elements selected from the group consisting of: Al, Ga, In, Y, La, and Gd;

B comprises one or more elements selected from the group consisting of: Eu, Ce, Cu, Ag, Al, Tb, Cl, Br, F, I, Mg, Pr, K, Na, and Mn;

wherein p can be either about 2 or about 4, and q can be either about 4 or about 7, subject to the provisos that when p is about 2, q is about 4 and when p is about 4, q is about 7;

wherein x and y are each independently any value between 0 and 1, subject to the provisos that the sum of x and y is equal to any number in the range of between about 0.75 and about 1.25, the sum of m and n is about 1; and

wherein B is present in any amount between 0.0001% and about 10 % in mole percent based on the total molar weight of said composition.

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31) A composition according to claim 30 wherein $0 \leq x \leq 1$ and $0 \leq y \leq 1$.

32) A composition according to claim 30 wherein $0.5 \leq x \leq 1$ and $0 \leq y \leq 0.5$.

33) A composition according to claim 30 wherein $0 \leq x \leq 0.5$ and $0 \leq y \leq 0.5$.

34) A composition according to claim 30 wherein $0 \leq x \leq 0.5$ and $0.5 \leq y \leq 1.0$.

35) A composition according to claim 30 wherein x is about 0, and y is about 1.

36) A composition according to claim 30 wherein x is about 1, and y is about 0.

37) A composition according to claim 30 wherein M comprises zinc and strontium.

38) A composition comprising at least two different phosphors according to claim 30.

39) A light emitting device comprising a phosphor according to claim 30.

40) A light emitting device according to claim 39, wherein said phosphor emits white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

41) A light emitting device according to claim 39 comprising a mixture of at least two different phosphors described by said formula.

42) A light emitting device according to claim 41, wherein said mixture of phosphors emit white light when contacted with light having a wavelength of between about 360 and about 480 nanometers.

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